REMARKS

These remarks and the accompanying amendments are responsive to the Office Action dated March 16, 2007 (hereinafter referred to as the "Office Action"). At the time of the last examination, Claims 7-10 were pending, of which Claims 7 and 9 are independent. By this response, Claims 7-10 are cancelled, and new Claims 11-14 are added, of which Claims 11 and 13 are independent.

1) In the Advisory Action of July 5, 2007, the Examiner states that the Applicant is invited to see United States Patent Number 5,369,637 issued to Richardson et al. (hereinafter "Richardson"), where Figure 4 and its description supports the motivation of using more radio frames (slots in the patent) when the data rate is low in order to maintain the fidelity of the digitized speech.

Considering the Advisory Action, the Applicant has canceled Claims 7-10, and newly added Claims 11-14. In Claims 11-14, we have clarified that claims 11-14 are applied to a CDMA (Code Division Multiple Access) communication, not a TDMA (Time Division Multiple Access) communication.

2) Re: claims 11-14

Claims 11-14 are applied to a CDMA communication in which each user simultaneously uses the same radio frames of a fixed duration on a physical channel to transmit data, and the transmitted data of different users is divided between the different users by using different spreading codes allocated to respective users.

In this CDMA communication, claims 11-14 form logical channel units each of which is to be subjected to error detection and includes information of a logical channel and an error

detecting code added to the information, and map the logical channel unit into one or more radio frames.

Here, claims 11-14 make the number of radio frames of the physical channel into which the logical channel unit is mapped larger in a case where a transmission rate of the physical channel is low, than that in a case where the transmission rate is high.

According to this feature, claims 11-14 can suppress increase of the ratio of the error detecting code (for example, CRC) to information, when the transmission rate of the physical channel is low. That is, claims 11-14 can accomplish efficient transmission. For the details, please see the attached Appendix 1.

3) Re: Richardson

Richardson disclose a mechanism which provides flexibility in the symbol rates and/or modulation schemes used by complementary users, and prevents adversely affecting the operation of the base stations and/or mobile transceivers by doubling the length of the time slot to keep the number of symbols per slot constant when the rate is halved (please see lines 4-8 of abstract, column 3, lines 18-42, etc. of Richardson).

The invention of Richardson relates to a TDMA communication system which multiplexes users by assigning time slots. That is, a plurality of users share the time slots in the frame in time division.

Further, according to Figure 4 and its description (column 3, lines 43-57) to which the Examiner refer and Figure 3 and its description (column 3, lines 18-33) of Richardson et al, because the number of symbols per time slot is maintained substantially constant, the length (or duration) of a time slot is effectively doubled for the low rate structure so that the duration of one

frame of the low rate structure corresponds to the duration of 2 high rate frame structure. This feature is shown in both Figures 3 and 4.

4) Comparing claims 11-14 with Richardson

4-1) As we explained above, claims 11-14 are applied to a CDMA communication in which each user simultaneously uses the same radio frames of a fixed duration on a physical channel to transmit data, and the transmitted data of different users is divided between the different users by using different spreading codes allocated to respective users.

In contrast, Richardson is applied to a TDMA communication in which a plurality of users share the time slots in the frame in time division.

That is, claims 11-14 multiplex each user by spreading codes, while Richardson multiplexes each user by time slots.

Thus, claims 11-14 differ from Richardson, and therefore claims 11-14 are not obvious over Richardson et al.

Further, the mechanism of Richardson is specific to a TDMA communication in which one user uses one or more time slots in a single frame, and another user uses other one or more time slots in that frame.

For example, as the Examiner points out in this Advisory Action, in Richardson, in order to maintain the fidelity of the digitized speech, the equivalent of two time slots in each high rate frame are in the low rate frame devoted to each transaction which leads to halving the capacity (please see column 3, lines 30-33 of Richardson).

In contrast, in a CDMA communication, a plurality of users do not share the time slots in a single frame. Thus, if the rate decreases from R (normal rate) to 1/2R (half rate), it is impossible to increase (double) time slots allocated to one user in a single frame to maintain the quality of the communication of that user, while decrease (halve) the user capacity of that frame.

Thus, there is no motivation for one skilled in the art to combine the invention of Richardson with a CDMA communication.

4-2) Claims 11-14 form logical channel units each of which is to be subjected to error detection and includes information of a logical channel and an error detecting code added to the information.

In contrast, Richardson does not disclose an error detecting code. Therefore it is clear that Richardson does not disclose "a logical channel unit which is to be subjected to error detection and includes information of a logical channel and an error detecting code added to the information".

Thus, also from this point of view, claims 11-14 are not obvious over Richardson.

4-3) Claims 11-14 map the logical channel unit into one or more radio frames.

In contrast, as we explained above, Richardson does not disclose a logical channel unit.

Therefore, it is clear that Richardson does not disclose "mapping the logical channel unit into one or more radio frames".

Thus, also from this point of view, claims 11-14 are not obvious over Richardson.

4-4) Claims 11-14 make the number of radio frames of the fixed duration on the physical channel into which the logical channel unit is mapped larger in a case where a transmission rate of the physical channel is low, than that in a case where the transmission rate is high. Thus, claims 11-14 can suppress increase of the ratio of the error detecting code to information, when the transmission rate of the physical channel is low.

In contrast, as we explained above, Richardson does not disclose a logical channel unit.

Further, in Richardson, the length (duration) of a single slot changes between two different rates (please see column 3, lines 24-30 of Richardson et al). Thus, "slots" of Richardson are different from "radio frames of the fixed duration" of claims 11-14.

Therefore, it is clear that Richardson does not disclose "making the number of radio frames of the fixed duration on the physical channel into which the logical channel unit is mapped larger in a case where a transmission rate of the physical channel is low, than that in a case where the transmission rate is high".

Further, as we explained above, the purpose and advantage of the invention disclosed in Richardson is to provide flexibility in the symbol rates and/or modulation schemes used by complementary users, and prevent adversely affecting the operation of the base stations and/or mobile transceivers by doubling the length of the time slot to keep the number of symbols per slot constant when the rate is halved.

Meanwhile, claims 11-14 make the number of radio frames of the fixed duration on the physical channel into which the logical channel unit is mapped larger in a case where a transmission rate of the physical channel is low, than that in a case where the transmission rate is

high, and thereby suppress increase of the ratio of the error detecting code to information, when the transmission rate of the physical channel is low.

Therefore, the purpose and advantage of Richardson is completely different from those of claims 11-14.

It is clear that Richardson cannot accomplish the advantage of claims 11-14 (suppressing increase of the ratio of the error detecting code to information, when the transmission rate of the physical channel is low).

Further, since Richardson does not use an error detecting code, the problem that claims 11-14 deal with (increase of the ratio of the error detecting code to information) does not exist at all in Richardson.

Therefore, also from this point of view, it is clear that Richardson cannot accomplish the advantage of claims 11-14 (suppressing increase of the ratio of the error detecting code to information, when the transmission rate of the physical channel is low).

Thus, also from these points of view, claims 11-14 are not obvious over Richardson.

None of the references cited in the past Office Actions including Richardson discloses this feature of claims 11-14 (making the number of radio frames of the fixed duration on the physical channel into which the logical channel unit is mapped larger in a case where a transmission rate of the physical channel is low, than that in a case where the transmission rate is high).

Further, none of the references cited in the past Office Actions including Richardson et al can accomplish this advantage of claims 11-14 (suppressing increase of the ratio of the error detecting code to information, when the transmission rate of the physical channel is low).

Thus, claims 11-14 are not obvious over prior art, and therefore should be patented. Accordingly, favorable action is respectfully requested.

[Appendix 1]

1 Explanation of solution of claims 11-14 and its advantage in comparison with simple solution

First, we explain the simple solution for mapping the logical channel into the physical channel. Then, we explain the solution of claims 11-14 for mapping the logical channel into the physical channel, and its advantage.

1.1 Simple solution

1) We explain the simple solution for mapping the logical channel into the physical channel. Although this solution is simple one, it seems that this solution is not even prior art.

2) First, we consider an example of Reference Figure 1 in which the logical channel is mapped into the physical channel whose transmission rate is 256 bits/frame. The information of logical channel and the physical channel are shown in Reference Figure 1(a) and 1(b), respectively.

In order to map the logical channel into the physical channel, first of all, the information of logical channel is divided into segments.

The simple solution for dividing the information of logical channel into segments is to divide the information of logical channel into segments such that each segment can be mapped into a single frame on the physical channel. According to this solution, in the example of Reference Figure 1, the information of logical channel is divided into segments each of which has 256-16 = 240 bits (please see Reference Figure 1(i)). Here, 256 bits are the number of bits of a single frame, and 16 bits are the number of bits of the error detecting code (in this explanation, we use CRC as the error detecting code) which will be added to each information segment.

Then, CRC is added to each information segment to form each logical channel unit (please see Reference Figure 1(ii)).

Then, the logical channel is mapped into the physical channel (please see Reference Figure 1(iii)). That is, each logical channel unit is mapped into a single frame on the physical channel.

3) Second, we consider an example of Reference Figure 2 in which the logical channel is mapped into the physical channel whose transmission rate is 128 bits/frame. This rate is lower than that of Reference Figure 1 (256 bits/frame). The information of logical channel and the physical channel are shown in Reference Figure 2(a) and 2(b), respectively.

In order to map the logical channel into the physical channel, first of all, the information of logical channel is divided into segments. In the example of Reference Figure 2, the information of logical channel is divided into segments each of which has 128-16 = 112 bits (please see Reference Figure 2(i)). Here, 128 bits are the number of bits of a single frame, and 16 bits are the number of bits of CRC which will be added to each information segment. It is

usual that the number of bits of CRC does not change, even if the number of bits of information changes.

Then, CRC is added to each information segment to form each logical channel unit (please see Reference Figure 2(ii)).

Then, the logical channel is mapped into the physical channel (please see Reference Figure 2(iii)). That is, each logical channel unit is mapped into a single frame on the physical channel.

4) According to this simple solution, even if the transmission rate of the physical channel is low, a single logical channel unit is always mapped into a single frame on the physical channel. That is, contrary to claims 11-14, the number of frames on the physical channel into which each logical unit is mapped is not changed, even if the transmission rate of the physical channel is low.

In this solution, since CRC is added to each single frame, it is possible to maintain the rate of error detection per unit time to secure the communication quality.

1.2 Solution of claims 11-14 and its advantage

1) In the solution of claims 11-14, the mapping means/step makes the number of radio frames of the fixed duration on the physical channel into which the logical channel unit is mapped larger in a case where a transmission rate of the physical channel is low, than that in a case where the transmission rate is high.

According to the solution of claims 11-14, for example, the mapping can be conducted as shown in Reference Figures 3 and 4. In Reference Figure 3, the logical channel is mapped into

the physical channel whose transmission rate is 256 bits/frame, while in Reference Figure 4, the logical channel is mapped into the physical channel whose transmission rate is 128 bits/frame.

In Reference Figure 3, the number of frames on the physical channel into which each logical unit is mapped is one, while in Reference Figure 4, the number of frames on the physical channel into which each logical unit is mapped is two. In this way, the solution of claims 11-14 conducts mapping such that the number of frames on the physical channel into which each logical channel unit is mapped is large when the transmission rate of the physical channel is low.

2) The mapping of Reference Figure 3 is the same as that of Reference Figure 1.

3) Thus, next, we consider the mapping of Reference Figure 4. The information of logical channel and the physical channel are shown in Reference Figure 4(a) and 4(b), respectively.

In order to map the logical channel into the physical channel, first of all, the information of logical channel is divided into segments. In the example of Reference Figure 4, the information of logical channel is divided into segments each of which has 128+128-16 = 240 bits (please see Reference Figure 4(i)). Here, 128+128 = 256 bits are the number of bits of two frames. As we explained above, in Reference Figure 4, the number of frames into which each logical unit is mapped is two. 16 bits are the number of bits of CRC which will be added to each information segment.

Then, CRC is added to each information segment to form each logical channel unit (please see Reference Figure 4(ii)).

Then, the logical channel is mapped into the physical channel (please see Reference Figure 4(iii)). That is, each logical channel unit is mapped into two frames on the physical channel.

4) Advantage of solution of claims 11-14

The above-mentioned simple solution has a disadvantage that the ratio of CRC to information is high, when the transmission rate of the physical channel is low. That is, in Reference Figure 1 (256 bits/frame), the ratio of CRC to information is 16/240 = 0.067, while in Reference Figure 2 (128 bits/frame), the ratio of CRC to information is 16/112 = 0.14. If the ratio of CRC to information is high, the amount of information that can be transmitted is small, and therefore the transmission efficiency is low.

Meanwhile, the solution of claims 11-14 has an advantage that it suppresses increase of the ratio of CRC to information, when the transmission rate of the physical channel is low. That is, in Reference Figure 3 (256 bits/frame), the ratio of CRC to information is 16/240 = 0.067, while in Reference Figure 4 (128 bits/frame), the ratio of CRC to information is still 16/240 = 0.067. Thus, the solution of claims 11-14 can accomplish efficient transmission.

In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, the Examiner is requested to contact the undersigned attorney.

Dated this 14th day of September, 2007.

Respectfully submitted,

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